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Roitberg

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(54) **POWER CONNECTOR HAVING A CONTACT CONFIGURED TO TRANSMIT ELECTRICAL POWER TO SEPARATE COMPONENTS**

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H01R 13/10 (2006.01)

(52) **U.S. Cl.** **439/682**; 439/907

(58) **Field of Classification Search** 439/682, 439/907, 507, 510–512
See application file for complete search history.

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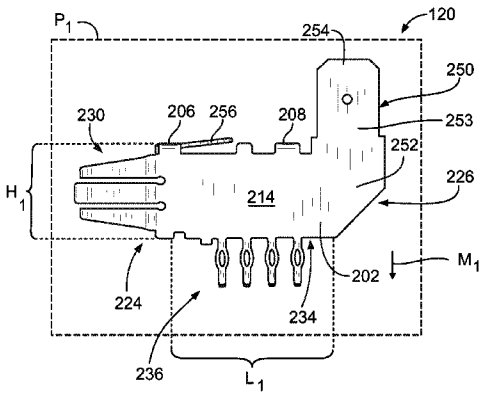
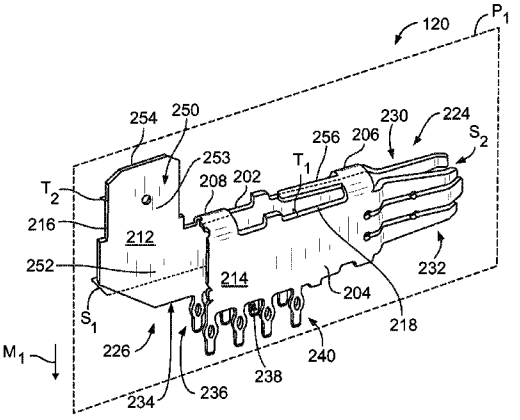
Primary Examiner — Tho D Ta

(57) **ABSTRACT**

Power connector including a connector housing having a mating side configured to engage an electrical connector. The connector housing also has a mounting side configured to interface with a circuit board. The connector housing includes a housing cavity that opens to the mating side. The power connector also includes a power contact that is held within the housing cavity. The power contact includes a body panel that extends along a contact plane and has board terminals and a contact terminal that extend from the body panel. The board terminals extend away from the body panel in a mounting direction to engage the circuit board. The contact terminal extends in a different direction that is one of parallel to the circuit board or away from the circuit board. The power contact is configured to transmit electrical power through the board terminals and through the contact terminal.

20 Claims, 4 Drawing Sheets





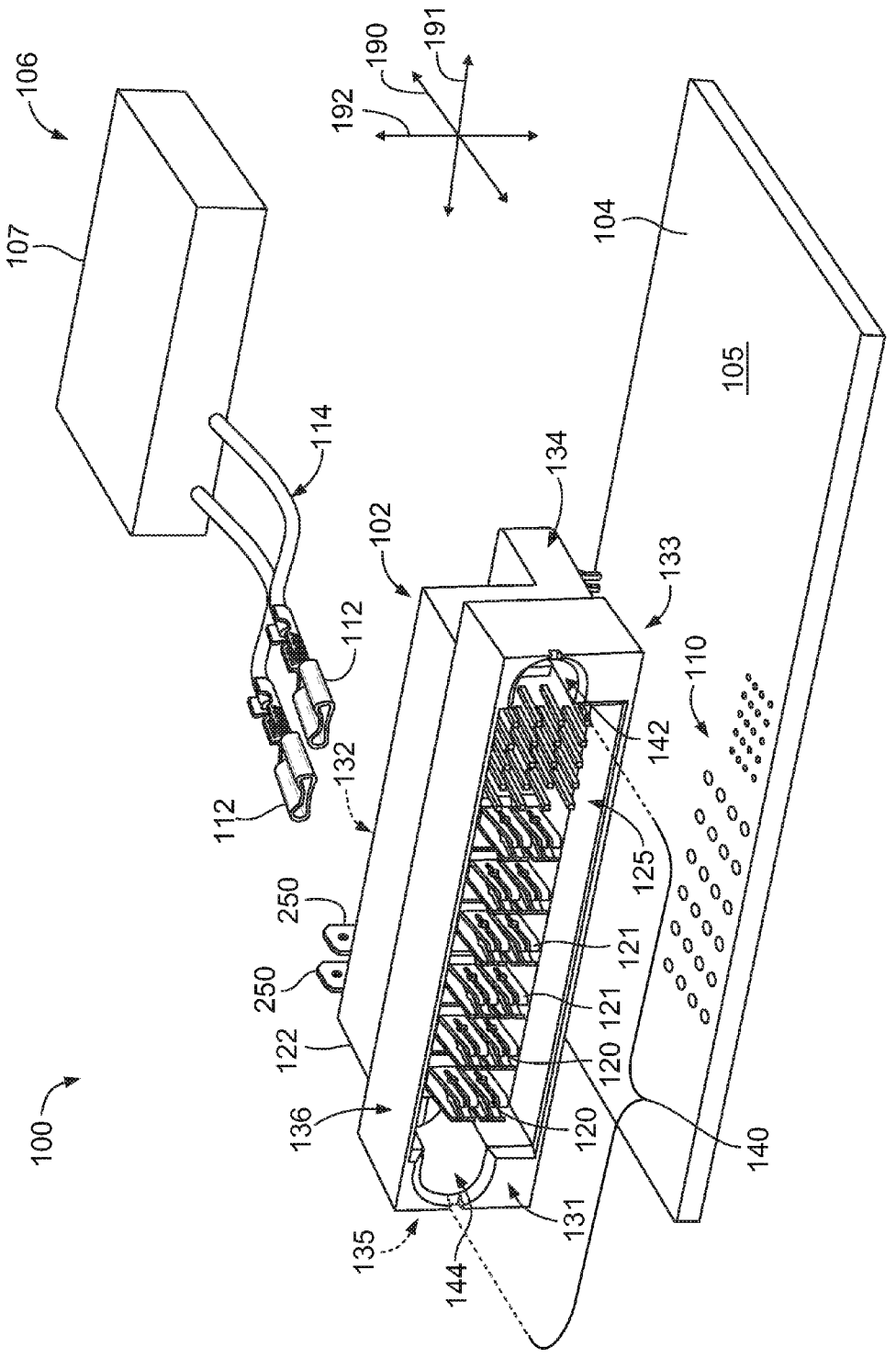

106
107
114
112
112
132
102
134
133
104
105
110
142
125
121
121
120
120
122
250
250
136
135
144
131
140
100
190
191
192

FIG. 1

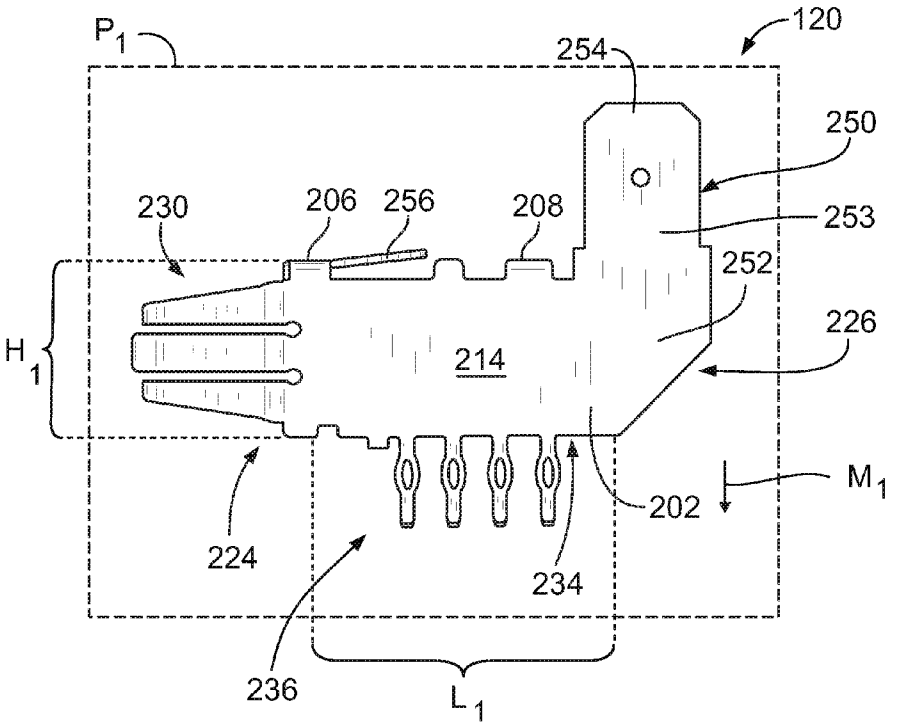

P1
120
254
250
230
206
256
208
253
252
226
H1
214
M1
202
224
234
236
L1

FIG. 2

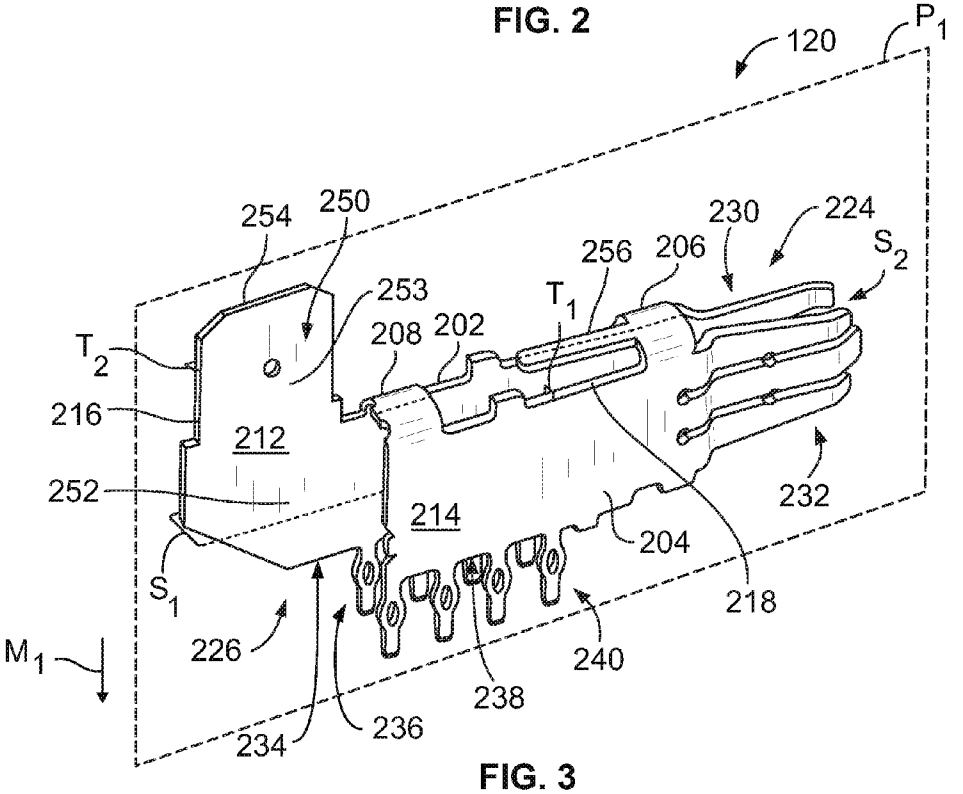

120
P1
254
250
230
224
S2
256
206
253
T1
208
202
T2
216
212
252
214
232
204
S1
218
M1
226
240
238
234
236

FIG. 3

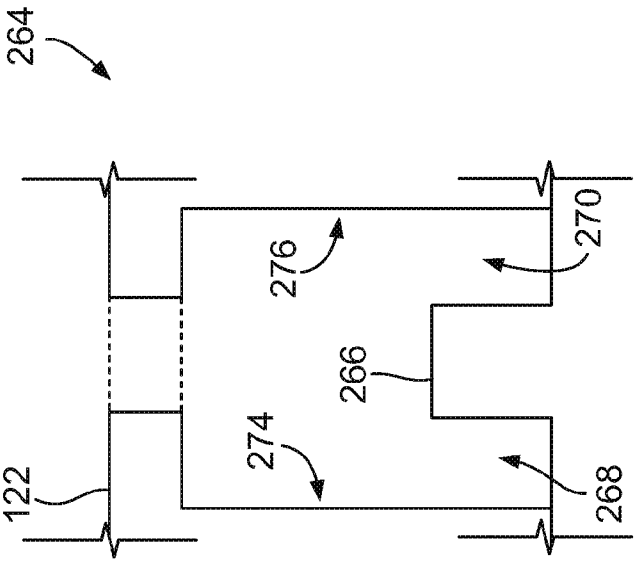

264
276
270
266
274
122
268

FIG. 5

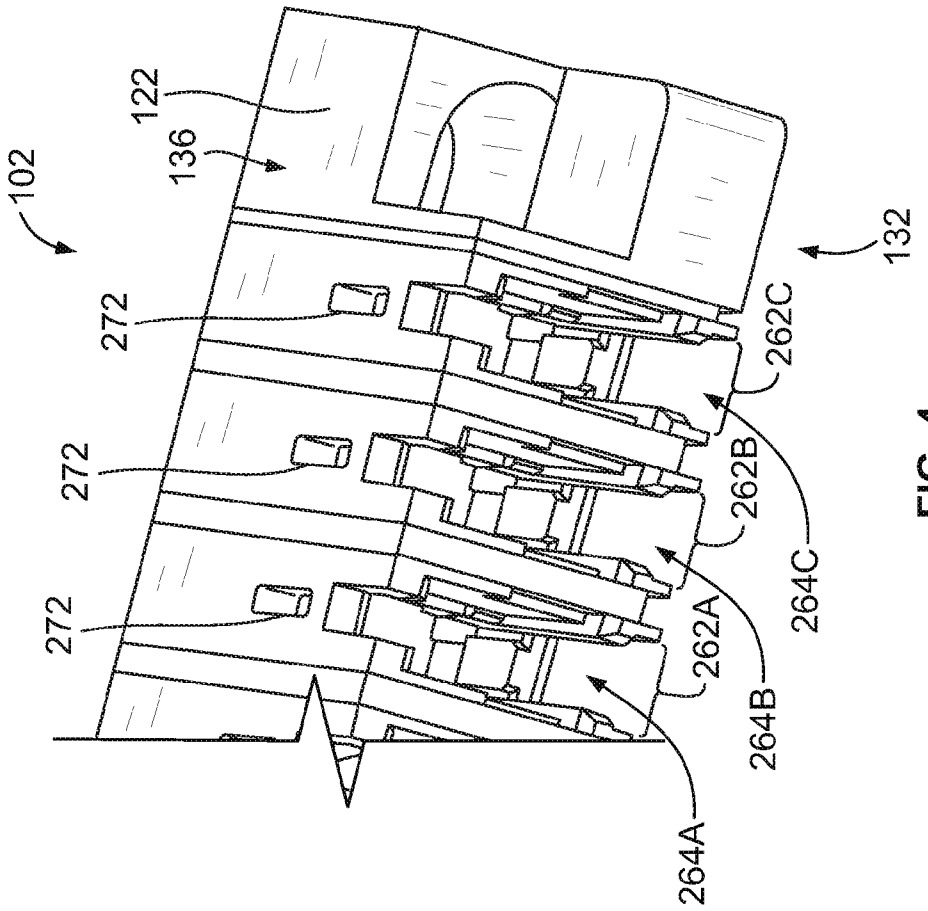

102
122
136
132
272
272
272
262C
262B
264C
262A
264B
264A

FIG. 4

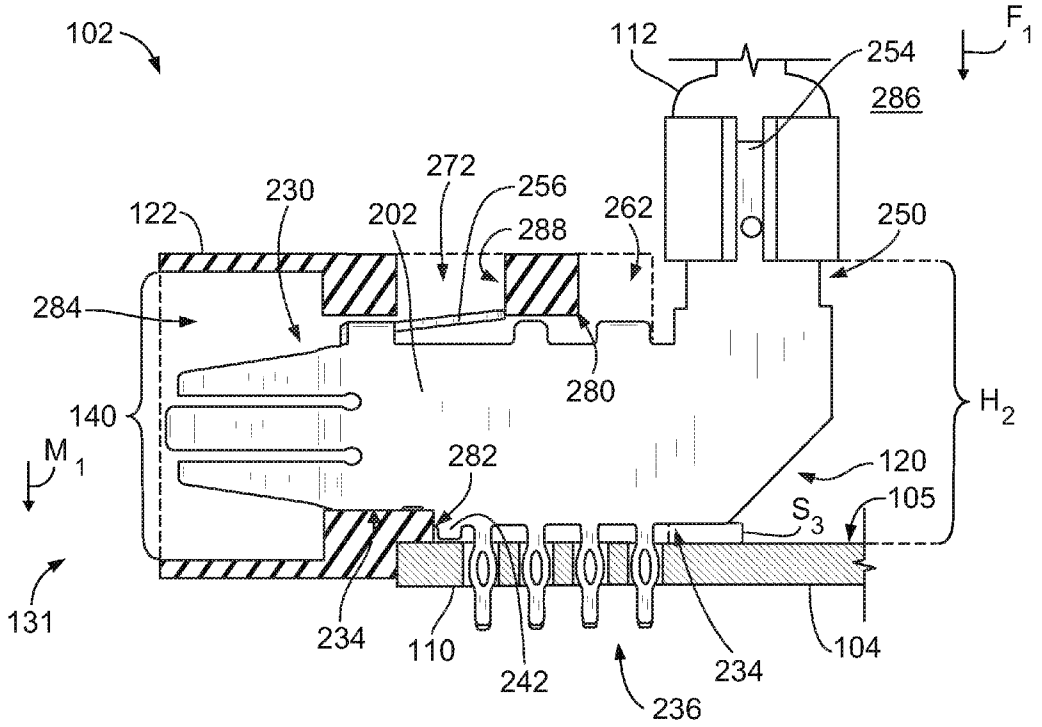

102
112
254
286
F_1
122
230
202
272
256
288
262
250
284
280
140
H_2
M_1
282
120
105
S_3
131
234
110
242
234
104
236

FIG. 6

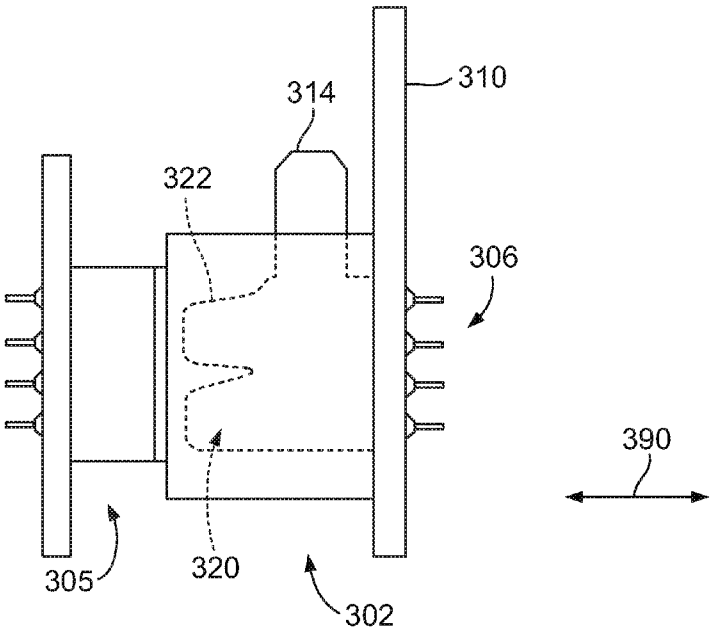

310
314
322
306
390
305
320
302

FIG. 7

POWER CONNECTOR HAVING A CONTACT CONFIGURED TO TRANSMIT ELECTRICAL POWER TO SEPARATE COMPONENTS

BACKGROUND OF THE INVENTION

The subject matter herein relates generally to power connectors, and more particularly, to power connectors configured to supply power to separate components in an electrical system.

In some cases, it is desirable to reduce or minimize an amount of space that an electrical system or an electronic device uses. For example, a known computer system may include several electrical components that are enclosed within a common housing. To reduce the amount of spaced used by the computer system, the various electrical components may be arranged and configured with respect to one another to minimize the necessary space while also satisfying predetermined requirements for the computer system.

It may also be desirable to increase the working capabilities of an existing electrical system, such as the computer system discussed above. For instance, during the lifetime of the computer system it may be necessary or desirable to replace an electrical component with a newer version of the electrical component. However, introducing updated electrical components into an existing electrical system may present challenges. For example, if the new electrical component requires additional power to operate, the original configuration of the computer system may not be able to satisfy the increased power demand. One option may be to insert an additional component into the computer system that is capable of providing the power. However, adding an electrical component to an existing computer system may be impractical since the computer system was particularly configured for the other electrical components. It may be necessary to reposition one or more of the other electrical components in order to provide space for the new electrical component.

BRIEF DESCRIPTION OF THE INVENTION

In one embodiment, a power connector is provided that includes a connector housing having a mating side configured to engage an electrical connector. The connector housing also has a mounting side configured to interface with a circuit board. The connector housing includes a housing cavity that opens to the mating side. The power connector also includes a power contact that is held within the housing cavity and configured to engage the electrical connector. The power contact includes a body panel that extends along a contact plane and has board terminals and a contact terminal that extend from the body panel. The board terminals extend away from the body panel in a mounting direction to engage the circuit board. The contact terminal extends in a different direction that is one of parallel to the circuit board or away from the circuit board. The power contact is configured to transmit electrical power through the board terminals and through the contact terminal.

In another embodiment, a power connector is provided that includes a connector housing having a mating side configured to engage an electrical connector and a mounting side configured to interface with a circuit board. The connector housing includes a housing cavity that opens to the mating side. The power connector also has first and second power contacts that are held within the housing cavity and configured to engage the electrical connector. Each of the first and second power contacts includes a body panel that extends along a corresponding contact plane. Each of the first and second power contacts has board terminals that extend away from the respective body panel in a mounting direction to engage the circuit board. The first power contact includes a contact terminal extending away from the body panel of the first power contact in a direction that is different than the mounting direction. The first power contact is configured to transmit electrical power through the contact terminal and through the respective board terminals. The second power contact is configured to exclusively transmit electrical power between the electrical connector and the circuit board.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is an exploded view of an electrical assembly that includes a power connector formed in accordance with one embodiment.

FIG. **2** is a side view of a power contact that may be used with the power connector of FIG. **1**.

FIG. **3** is a perspective view of the power contact of FIG. **2**.

FIG. **4** is a perspective view of a portion of a connector housing that may be used with the power connector of FIG. **1**.

FIG. **5** is an end-view of a contact-receiving slot that may be used with the electrical connector of FIG. **1**.

FIG. **6** is a cross-section of the power connector of FIG. **1**.

FIG. **7** is a side view of a power connector formed in accordance with another embodiment that is engaged with an electrical connector.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments described herein include power connectors that are configured to be mounted to a first electrical component, such as a circuit board. The power connectors include one or more power contacts that are capable of providing separate electrical pathways to deliver power to the first electrical component and to a separate second electrical component. For example, the power contacts may include board terminals that electrically engage a circuit board and a contact terminal that extends in a direction that is one of parallel to the circuit board or away from the circuit board. The contact terminal may engage the second electrical component (e.g., video card). In particular embodiments, power connectors may include first and second types of power contacts. The first type of power contacts include the contact terminals and are capable of delivering power to separate components, and the second type of power contacts may not include the contact terminals and may exclusively transmit electrical power to one electrical component (e.g., a circuit board). The first and second types of power contacts may have similar structures so that the first and second types of power contacts can be inserted into similarly shaped contact-receiving slots. Moreover, in some embodiments, the first type of power contacts may be used to replace the second type of power contacts (also referred to as existing power contacts).

FIG. **1** is an exploded view of an electrical assembly **100** that includes a power connector **102** formed in accordance with one embodiment. The electrical assembly **100** also includes a circuit board **104** and an electrical component **106**. Both the circuit board **104** and the electrical component **106** may receive electrical power from the power connector **102**. The electrical assembly **100** may be located within, for example, a housing of a larger electrical system (not shown). The power connector **102** is configured to transmit electrical power that is delivered from a mating or electrical connector (not shown) to the circuit board **104** and also to the electrical component **106**. The electrical connector may be similar to the electrical connector **305** shown in FIG. **7**. The power

connector **102** and the electrical connector may also be referred to as first and second connectors, respectively. Furthermore, the circuit board **104** and the electrical component **106** may be referred to as first and second electrical components, respectively. As shown in FIG. **1**, the electrical component **106** may be located remotely from the power connector **102**.

In particular embodiments, the power connector **102** is configured to be mounted and electrically engaged to the circuit board **104**. The power connector **102** includes power contacts **120** that electrically engage thru-holes **110** of the circuit board **104** and also electrically engage corresponding component contacts **112** of the electrical component **106**. The power connector **102** may also include power contacts **121** that engage only the electrical connector and the circuit board **104**. In addition to the power contacts **120** and **121**, the power connector **102** may include signal contacts **125** that transmit signals between the electrical connector and the circuit board **104**.

An electrical component may be, for example, an electrical device of the larger electrical system (e.g., video card, housing fan, network card, and the like), another circuit board, or another electrical connector. In the illustrated embodiment, the electrical component **106** includes the component contacts **112** and wires **114**. The component contacts **112** may be Faston® contacts produced by Tyco Electronics that are configured to grip contact terminals **250** of the power contacts **120**. The component contacts **112** may be coupled to the wires **114** through crimping. The wires **114**, in turn, may be electrically coupled to a component body **107** of the electrical component **106**. In alternative embodiments, the component contacts **112** may be of other types, such as pin contacts, socket contacts, contact pads, and the like. Furthermore, the component contacts **112** may be directly connected to the electrical component **106** (i.e., without the interconnecting wires **114**). In such embodiments, the electrical component **106** may be directly mounted to the power connector **102**.

The power connector **102** includes a connector housing **122** having a plurality of housing sides **131-136**. As shown, the power connector **102** is oriented with respect to a longitudinal axis **190**, a lateral axis **191**, and an orientation axis **192**. The housing sides **131-136** may include a mating side **131**, a loading side **132**, and a mounting side **133** that extends between the mating and loading sides **131** and **132** in a direction along the longitudinal axis **190**. In the illustrated embodiment, the power connector **102** is a right-angle connector such that the mating and loading sides **131** and **132** are opposite of each other (i.e., the mating and loading sides **131** and **132** face in opposite directions away from each other). However, in alternative embodiments, the power connector **102** may be a vertical or straight connector such that the mating and mounting sides **131** and **133** are opposite with respect to each other and the loading side **132** extends therebetween. The power connector **302** shown in FIG. **7** illustrates such an embodiment.

The housing sides **131-136** also include end sides **134** and **135** that extend between the mating and loading sides **131** and **132** in a direction along the longitudinal axis **190**. The end sides **134** and **135** also have the lateral axis **191** extending therebetween. Furthermore, the connector housing **122** may include the housing side **136** that is opposite with respect to the mounting side **133**. As shown, the mounting side **133** is configured to be mounted to and interface with a board surface **105** of the circuit board **104**.

Also shown in FIG. **1**, the connector housing **122** includes a housing cavity **140** that opens to the mating side **131**. The mating side **131** is configured to engage the electrical connector (not shown). The connector housing **122** is configured to hold one or more of the power contacts **120** and **121** and the signal contacts in the housing cavity **140**. The housing cavity **140** is sized and shaped to receive the electrical connector. The electrical connector includes corresponding mating contacts (not shown) that electrically engage the power contacts **120** and **121** and the signal contacts **125**. The housing cavity **140** may also include alignment spaces **142** and **144**. The alignment spaces **142** and **144** are configured to receive alignment features (not shown) of the electrical connector to align the electrical connector and the power connector **102**.

By way of example only, the electrical connector and the power connector **102** may be board-to-board connectors that establish an electrical connection through each other to transmit power and data signals between separate circuit boards. The circuit boards may be oriented to be co-planar with each other, parallel to each other, or perpendicular to each other when the electrical connector and the power connector **102** are engaged. However, the electrical connector and the power connector **102** may be configured to establish an electrical connection between other components and at other orientations. In particular embodiments, the electrical connector is a plug assembly and the power connector **102** is a right-angle receptacle assembly. Alternatively, the electrical connector may be the receptacle assembly and the power connector **102** may be the plug assembly.

FIGS. **2** and **3** are isolated side and perspective views, respectively, of the power contact **120**. In the illustrated embodiment, the power contact **120** includes first and second body panels **202** and **204** (FIG. **3**) and bridge portions **206** and **208** that join the body panels **202** and **204**. The body panels **202** and **204** may be substantially planar structures and extend parallel to each other with a spacing S_1 (FIG. **3**) therebetween. As shown, the power contact **120** may be oriented with respect to a contact plane P_1 that extends substantially parallel to the body panels **202** and **204** within the spacing S_1. The contact plane P_1 intersects the bridge portions **206** and **208** along the dashed lines, as shown in FIG. **3**, and the body panels **202** and **204** are on opposite sides of the contact plane P_1.

With reference to FIG. **3**, the power contact **120** may be stamped and formed from a conductive sheet of material in some embodiments. As shown, the sheet of material may be stamped along stamped edges **216** and **218**. The stamped sheet of material may have opposite side surfaces **212** and **214** that define a thickness T_1 therebetween. In the illustrated embodiment, the thickness T_1 is uniform throughout the power contact **120**. The stamped sheet of material may be folded at the bridge portions **206** and **208** such that the body panels **202** and **204** overlap and are parallel to each other. Also shown in FIG. **3**, the side surface **212** along the body panel **202** faces the side surface **212** along the body panel **204**. The body panels **202** and **204** may face each other across the spacing S_1.

As shown in FIGS. **2** and **3**, the power contact **120** may have a leading end **224** and a trailing end **226**. The body panel **202** includes one or more contact beams **230** that project in a longitudinal direction (i.e., in a direction along the longitudinal axis **190** (FIG. **1**)) from the leading end **224**. The body panel **204** includes one or more contact beams **232** (FIG. **3**) that project in a longitudinal direction from the leading end **224**. The contact beams **230** and **232** extend generally parallel to one another. The contact beams **230** and **232** are opposite each other and have a spacing S_2 (FIG. **3**) therebetween. The contact beams **230** and **232** may be shaped to engage a corresponding contact (not shown) of the electrical connector. For example, the contact beams **230** and **232** may engage the

corresponding contact along the side surface **214** such that the contact beams **230** and **232** are deflected toward one another. However, in alternative embodiments, the contact beams **230** and **232** may have other configurations and be configured to engage the corresponding contact in other manners. For example, the corresponding contact may be received within the spacing S_2 between the contact beams **230** and **232** such that the contact beams **230** and **232** flex away from each other.

The body panel **202** also includes a mounting edge **234** that extends between the leading and trailing ends **224** and **226**. The power contact **120** may include a plurality of board terminals **236** that project therefrom in a mounting direction M_1. The mounting direction M_1 may be in a direction along the orientation axis **192** (FIG. **1**). Likewise, the body panel **204** also includes a mounting edge **238** (FIG. **3**) that extends between the leading and trailing ends **224** and **226** of the power contact **120**. The power contact **120** may include a plurality of board terminals **240** (FIG. **3**) that project therefrom in the mounting direction M_1. The board terminals **236** and **240** may extend substantially parallel to one another.

Also shown in FIGS. **2** and **3**, the body panel **202** may include a contact terminal **250** that projects from the trailing end **226**. The contact terminal **250** and the board terminals **236** and **240** extend in different directions. In particular embodiments, the contact terminal **250** extends in a direction that is away from the circuit board **104** (FIG. **1**). For example, as shown, the contact terminal **250** may extend in a direction that is generally opposite with respect to the mounting direction M_1. Furthermore, in alternative embodiments, the contact terminal **250** may extend in a direction that is oblique with respect to the board surface **105** (FIG. **1**). In other embodiments, the contact terminal **250** may extend in a direction that is substantially parallel to the circuit board **104**. By extending in a direction that is one of away from the circuit board **104** or parallel to the circuit board **104**, the contact terminal **250** may be spaced apart from the circuit board **104** so that a corresponding component contact **112** (FIG. **1**) and the contact terminal **250** may engage each other.

The contact terminal **250** has a base portion **252** that extends from the trailing end **226** and a distal end **254** that is configured to be received by the component contacts **112**. A terminal body **253** may extend between the base portion **252** and the distal end **254**. In the illustrated embodiment, the contact terminal **250** is a contact blade or contact tab. The distal end **254** may be shaped to engage a Faston®-type contact. Moreover, the contact terminal **250** may have a substantially planar structure that has a thickness T_2 (FIG. **3**). The thickness T_2 may be substantially equal to the thickness T_1.

In some embodiments, the body panel **202** and the board terminals **236** are coplanar. In some embodiments, the board terminals **236** and the contact terminal **250** are coplanar. In the illustrated embodiment, the contact terminal **250** is coplanar with the board terminals **236** and also the body panel **202**. More specifically, the body panel **202**, the contact terminal **250**, and the board terminals **236** may be coplanar and extend parallel to the contact plane P_1. The body panel **202**, the contact terminal **250**, and the board terminals **236** may also have a uniform thickness T_1.

Also shown in FIGS. **2** and **3**, the power contact **120** may include a spring member **256**. The spring member **256** may extend from the bridge portion **206** in a rearward direction toward the trailing end **226**. However, in alternative embodiments, the spring member **256** may have a different position. As shown, the spring member **256** is in a relaxed position, but the spring member **256** is also configured to be deflected toward the body panels **202** and **204**.

With reference to FIG. **2**, the body panel **202** may have a panel structure that is sized and shaped to accommodate the board terminals **236** and the contact beams **230** extending therefrom. For example, the mounting edge **234** along the body panel **202** may extend a length L_1 (or a first dimension) between the leading and trailing ends **224** and **226** that is long enough to accommodate the plurality of board terminals **236**. The board terminals **236** may be spaced apart from each other in the longitudinal direction along the mounting edge **234**. Furthermore, the board terminals **236** may be aligned with one another along the mounting edge **234**. In the illustrated embodiment, the length L_1 is sufficiently long to accommodate four (4) board terminals **236** that are aligned and spaced apart from each other along the mounting edge **234**. In alternative embodiments, the length L_1 may be configured to accommodate only a single board terminal, at least two, at least three, or more than four board terminals **236**. In addition, the power contact **120** may have a height H_1 (or a second dimension) that is able to accommodate the plurality of contact beams **230**. As shown, the power contact **120** may have three (3) contact beams **230** projecting from the leading end **224** that are stacked or aligned with respect to each other along the orientation axis **192** (FIG. **1**). However, in alternative embodiments, the power contact **120** may have only a single contact beam, two contact beams, or more than three contact beams.

Although not shown in FIG. **2**, the board terminals **240**, the contact beams **232**, and the body panel **204** (FIG. **3**) may also be configured similarly as described above with respect to the board terminals **236** and the contact beams **230** of the body panel **202**.

Although the illustrated embodiment of the power contact **120** includes a pair of body panels **202** and **204**, in alternative embodiments, the power contact **120** may only include a single body panel. For example, the power contact **120** may only include a body panel without the bridge portions **206** and **208** and the body panel **204**. In such embodiments, the body panel may have similar elements and features as described above with respect to the body panel **202**. Electrical power may be transmitted through a contact terminal, such as the contact terminal **250**, and a plurality of board terminals, such as the board terminals **236**.

FIG. **4** is a perspective view of a portion of the loading side **132** of the power connector **102**. As shown, the connector housing **122** may include a plurality of access openings **262**A-**262**C that provide access to respective contact-receiving slots **264**A-**264**C. The contact-receiving slots **264**A-**264**C may be defined by portions of the housing cavity **140** (FIG. **1**) where corresponding power contacts **120** and **121** (FIG. **1**) are held by the connector housing **122**. The connector housing **122** may comprise an insulative material that is molded into single structure. Alternatively, the connector housing **122** may be constructed from separate parts into an integral structure. Also shown in FIG. **4**, the connector housing **122** may include a plurality of member holes **272**. Each of the member holes **272** extends through the connector housing **122** from a corresponding contact-receiving slot **264** to an exterior of the connector housing **122**. The member holes **272** extend through the housing side **136**.

FIG. **5** is an end-view of an exemplary contact-receiving slot **264**. The connector housing **122** may be shaped to include opposing sidewalls **274** and **276** that define at least a portion of the corresponding contact-receiving slots **264**. The connector housing **122** may also include a base support **266** and a pair of guide channels **268** and **270** that extend between the sidewalls **274** and **276** and the base support **266**. The guide channels **268** and **270** are sized and shaped to receive the body

panels **202** and **204** (FIGS. **2** and **3**) such that the mounting edges **234** and **238** (FIGS. **2** and **3**) rest along surfaces of the guide channels **268** and **270**, respectively.

The contact-receiving slots **264**A-**264**C may be similarly or identically shaped. Furthermore, the power contacts **120** and **121** may have similar structures such that identically or similarly shaped contact-receiving slots **264** may hold either of the power contacts **120** and **121**. Accordingly, the power connector **102** (FIG. **1**) may be reconfigured as desired. Furthermore, existing power contacts that are similar to power contacts **121** may be replaced by the power contacts **120**. Also, although not shown, the power contacts **120** and **121** may have an identical number and arrangement of board terminals, such as the board terminals **236** and **240**.

FIG. **6** is a cross-section of the power connector **102** illustrating one of the power contacts **120** in the housing cavity **140**. To assemble the power connector **102**, the power contact **120** may be positioned and aligned to face the corresponding access opening **262**. The power contact **120** may be moved toward the access opening **262** so that the contact beams **230** and **232** (FIG. **3**) first advance through the access opening **262** and into a corresponding contact-receiving slot **264** (FIG. **5**) of the housing cavity **140**. The mounting edges **234** and **238** (FIG. **3**) may be inserted into and slide along the guide channels **268** and **270**, respectively (FIG. **5**). As shown, the power contact **120** may include one or more positioning members **242** that project in the mounting direction M_1 away from the mounting edges **234** and **238**. The positioning members **242** may engage an interior surface **282** of the connector housing **122**. The positioning member **242** and the interior surface **282** may prevent the power contact **120** from advancing further into the contact-receiving slot **264**.

As the power contact **120** is inserted into the contact-receiving slot **264**, the spring member **256** may engage an interior edge **280** of the connector housing **122**. The spring member **256** may be deflected from a relaxed condition toward the body panels **202** and **204** (FIG. **3**) and flex back to the relaxed condition when the spring member **256** is located within the member hole **272**. When the spring member **256** is located within the member hole **272**, the spring member **256** may engage the connector housing **122** at an interior surface **288** to prevent the power contact **120** from being withdrawn from the contact-receiving slot **264**. To remove the power contact **120**, the spring member **256** may be deflected toward the body panels **202** and **204** and the power contact **120** may be withdrawn.

As shown in FIG. **6**, when the positioning member **242** and the spring member **256** engage the connector housing **122**, the positioning and spring members **242** and **256** may cooperate with each other to prevent the power contact **120** from being moved in a direction along the longitudinal axis **190** (FIG. **1**). The sidewalls **274** and **276** (FIG. **5**) may also prevent the power contact **120** from being shifted in a direction along the lateral axis **191** or rotated about the orientation axis **192** (FIG. **1**). Accordingly, the contact-receiving slot **264** may be configured to retain the power contact **120** therein.

When the power contact **120** is disposed within the housing cavity **140**, the contact beams **230** and **232** may be located within an engagement space **284** of the housing cavity **140** proximate to the mating side **131**. The engagement space **284** may be sized and shaped to receive a portion of the electrical connector. Also shown, the contact terminal **250** extends into an exterior space **286** that surrounds at least a portion of the connector housing **122**. For example, the distal end **254** may extend beyond a height H_2 of the connector housing **122** such that the distal end **254** is exposed and positioned to engage the corresponding component contact **112** of the electrical component **106** (FIG. **1**).

Also shown in FIG. **6**, the board terminals **236** and **240** (FIG. **3**) are sized and shaped to engage and form an interference fit with the thru-holes **110** of the circuit board **104** when the power connector **102** is mounted to the circuit board **104**. When the power connector **102** is mounted to the circuit board **104**, the mounting edges **234** and **238** may interface with the board surface **105**. As shown, a spacing S_3 may exist between the mounting edges **234** and **238** and the board surface **105**. The board terminals **236** and **240** may be sized and shaped to transmit electrical power to the circuit board **104**. In the illustrated embodiment, the board terminals **236** and **240** are eye-of-needle contacts, but the board terminals **236** and **240** may be other contacts (e.g., pin contacts).

Accordingly, the power contact **120** may receive electrical power through the contact beams **230** and **232** and transmit the electrical power through several pathways. In the illustrated embodiment, the electrical power may be diverted along nine (9) separate pathways (eight board terminals **236** and **240** and the contact terminal **250**). Moreover, the electrical power may be transmitted to separate components, such as the circuit board **104** and the electrical component **106** (FIG. **1**). Accordingly, the body panels **202** and **204** may be sized and shaped to transmit a large amount of electrical current as compared to other contacts. By way of one example only, the power contact **120** may be configured to transmit about 45 A at a 30° C. temperature rise, and the contact terminal **250** may be configured to transmit 25 A.

Also shown in FIG. **6**, the component contact **112** may grip the contact terminal **250**. To engage the component contact **112** and the contact terminal **250**, a contact force F_1 may be applied to form an interference or compressive fit between the component contact **112** and the contact terminal **250**. The contact force F_1 may be applied in a direction that is generally opposite to the direction that the contact terminal **250** extends from the body panel **202**. For example, in the illustrated embodiment, the contact force F_1 is applied in a direction along the mounting direction M_1. In some embodiments, the contact terminal **250** may have dimensions that prevent inadvertent bending or deformation of the contact terminal **250** about the longitudinal or lateral axes **190** and **191** when the contact force F_1 is applied. For example, the contact terminal **250** may be sized and shaped to resist deformation when the component contact **112** is engaged to the contact terminal **250** in a misaligned manner.

FIG. **7** is a side view of a power connector **302** formed in accordance with another embodiment that is engaged with an electrical connector **305**. The electrical connector **305** may be a plug assembly and the power connector **302** may be a receptacle assembly configured to receive the electrical connector **305**. The power connector **302** is mounted to a circuit board **310** and includes a power contact **322**. In some embodiments, the power connector **302** is a vertical or axial connector. More specifically, the power connector **302** may have a vertical orientation such that contact beams **320** (indicated by dashed lines in FIG. **7**) and board terminals **306** of the power contact **322** extend in a common direction along a longitudinal axis **390**. Also shown, the power contact **322** may include a contact terminal **314** that is similar to the contact terminal **250** (FIG. **2**). The contact terminal **314** in FIG. **7** extends in a direction that is parallel to the circuit board **310** and perpendicular to the longitudinal axis **390**.

In some embodiments, a method of assembling a power connector, such as the power connectors **102** and **302**, is provided. The method may include providing a connector

housing that has a mating side that is configured to engage an electrical connector and a mounting side that is configured to interface with a circuit board. The connector housing includes a housing cavity that opens to the mating side. The method may also include disposing or positioning a power contact within the housing cavity. The power contact includes a body panel that extends along a contact plane and has board terminals and a contact terminal extending therefrom. The board terminals extend away from the body panel in a mounting direction to engage the circuit board. The contact terminal extends one of parallel to the circuit board or away from the circuit board. The power contact is configured to transmit electrical power through the board terminals and through the contact terminal.

In some embodiments, the method includes removing an existing power contact from a contact-receiving slot of the connector housing before disposing the power contact having the contact terminal within the housing cavity. An existing power contact is a power contact that has already been in commercial use. The existing power contact may not include a contact terminal, such as the power contacts **121** described above. In other embodiments, the method may include disposing a second power contact into the housing cavity. The second power contact may exclusively transmit electrical power to the circuit board, such as the power contacts **121**. More specifically, the second power contact may not include a contact terminal in some embodiments.

It is to be understood that the above description is intended to be illustrative, and not restrictive. In addition, the above-described embodiments (and/or aspects or features thereof) may be used in combination with each other. Furthermore, many modifications may be made to adapt a particular situation or material to the teachings of the invention without departing from its scope. Dimensions, types of materials, orientations of the various components, and the number and positions of the various components described herein are intended to define parameters of certain embodiments, and are by no means limiting and are merely exemplary embodiments. Many other embodiments and modifications within the spirit and scope of the claims will be apparent to those of skill in the art upon reviewing the above description. The scope of the invention should, therefore, be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. In the appended claims, the terms "including" and "in which" are used as the plain-English equivalents of the respective terms "comprising" and "wherein." Moreover, in the following claims, the terms "first," "second," and "third," etc. are used merely as labels, and are not intended to impose numerical requirements on their objects. Further, the limitations of the following claims are not written in means—plus-function format and are not intended to be interpreted based on 35 U.S.C. §112, sixth paragraph, unless and until such claim limitations expressly use the phrase "means for" followed by a statement of function void of further structure.

What is claimed is:

1. A power connector comprising:

a connector housing having a mating side configured to engage an electrical connector and a loading side that is opposite the mating side and has an access opening, the connector housing also having a mounting side that is configured to interface with a circuit board and a housing side that is opposite the mounting side, the connector housing including a housing cavity; and

a power contact held within the housing cavity and configured to engage the electrical connector, the power contact comprising first and second body panels and a bridge portion that joins the first and second body panels, the power contact being folded at the bridge portion such that the first and second body panels extend adjacent to each other, the first and second body panels having board terminals that extend away from the respective body panel in a mounting direction to engage the circuit board, the first body panel also having a contact terminal that is configured to engage a component contact;

wherein the contact terminal extends through the access opening of the loading side, the contact terminal including a base portion that extends beyond the loading side in a direction along the circuit board and also a terminal body that extends from the base portion in a direction that is away from the circuit board, the terminal body configured to engage the component contact when the component contact is moved in the mounting direction toward the circuit board.

2. The power connector in accordance with claim **1**, wherein the first body panel and the respective board terminals are coplanar and the second body panel and the respective board terminals are coplanar.

3. The power connector in accordance with claim **1**, wherein the first body panel and the contact terminal are coplanar.

4. The power connector in accordance with claim **1**, wherein the contact terminal is sized and shaped to resist deformation when the component contact is engaged to the in a misaligned manner.

5. The power connector in accordance with claim **1**, wherein the mounting and mating sides are oriented perpendicular to each other.

6. The power connector in accordance with claim **1**, wherein the second body panel does not have a contact terminal extending therefrom.

7. The power connector in accordance with claim **1**, wherein the access opening is sized and shaped to permit the power contact to be loaded into the housing cavity through the loading side.

8. The power connector in accordance with claim **1**, wherein the bridge portion is located a height away from the circuit board proximate to the housing side and the terminal body extends to a distal end that clears the height of the bridge portion.

9. The power connector in accordance with claim **1** wherein the power contact includes a spring member that extends from the bridge portion toward the loading side, the spring member configured to be deflected toward the body panels and engage the connector housing to prevent the power contact from being withdrawn from the housing cavity.

10. The power connector in accordance with claim **1** wherein the power contact includes at least one positioning member on the first or second body panels that project in the mounting direction, the positioning member(s) configured to engage the connector housing proximate to the circuit board to facilitate holding the power contact within the connector housing.

11. The power connector in accordance with claim **1** wherein the power contact includes a spring member that extends from the bridge portion and is configured to engage the connector housing and also at least one positioning member on the first or second body panels that project in the mounting direction, the positioning member(s) configured to engage the connector housing proximate to the circuit board, wherein the spring member and the positioning member(s) engage the connector housing, the positioning and spring

members cooperating with each other to prevent the power contact from being moved in a direction along the circuit board.

12. The power connector in accordance with claim **1** where each of the first and second body panels includes a plurality of contact beams that project toward the mating side and are configured to engage the electrical connector.

13. The power connector in accordance with claim **1**, wherein the power contact is stamped and formed from a single sheet of material.

14. A power connector comprising:

a connector housing having a mating side configured to engage an electrical connector and a loading side that is opposite the mating side and has an access opening, the connector housing also having a mounting side that is configured to interface with a circuit board and a housing side that is opposite the mounting side, the connector housing including a housing cavity; and

a power contact held within the housing cavity and configured to engage the electrical connector, the power contact comprising a body panel having board terminals that extend away from the body panel in a mounting direction to engage the circuit board, the body panel also having a contact terminal that is configured to engage a component contact;

wherein the contact terminal extends through the access opening of the loading side, the contact terminal including a base portion that extends beyond the loading side in a direction along the circuit board and also a terminal body that extends from the base portion in a direction that is away from the circuit board, the housing side being located a height away from the circuit board, the terminal body extending to a distal end that clears the height of the housing side, wherein the base portion is differently sized and shaped than the terminal body to resist deformation when the component contact is directly engaged to the distal end with a force that is in the mounting direction.

15. The power connector in accordance with claim **14**, wherein the base portion has a width that is measured along an axis that extends parallel to the circuit board and the terminal body has a width measured along the axis, the width of the base portion being greater than a width of the terminal body.

16. The power connector in accordance with claim **14**, wherein the power contact includes a positioning member on the body panel that projects in the mounting direction, the positioning member configured to engage the connector housing proximate to the circuit board to facilitate holding the power contact within the connector housing.

17. The power connector in accordance with claim **14**, wherein the body panel includes a plurality of contact beams that project toward the mating side and are configured to engage the electrical connector.

18. The power connector in accordance with claim **14**, wherein the body panel and the contact terminal are coplanar.

19. The power connector in accordance with claim **14**, wherein the mounting and mating sides are oriented perpendicular to each other.

20. The power connector in accordance with claim **14**, wherein the access opening is sized and shaped to permit the power contact to be loaded into the housing cavity through the loading side.

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